VIVEKANANDA GLOBAL UNIVERSITY, JAIPUR

FORMAT FOR OUTLINE OF PROPOSED RESEARCH INVESTIGATION FOR Ph.D. DEGREE

(TO BE SUBMITTED IN DUPLICATE BY RESEARCH SCHOLAR)

1. **Name of Scholar:** Anjum Zameer Bhat

2. **Registration number:** VGU/2015/RES/SCH/CS/0103

3. **Title of the Research Investigation (Max. 25 words):**
   Role of Cloud Computing in higher education and implementation challenges in higher education establishments in Oman and India

4. **Faculty/Department/Subject:**
   Department of Computer Science

5. **Objective and Scope of the Research Investigation (Approx. 500 words):**

Cloud Computing know as on demand computing is a concept which provides computing as a service, where shared resources and information are provided to computers and other devices on-demand. It is a model for enabling ubiquitous, on-demand access to a shared pool of configurable computing resources. Cloud computing, or "the cloud", also focuses on maximizing the effectiveness of the shared resources. Cloud resources are usually not only shared by multiple users but are also dynamically reallocated per demand. This approach helps maximize the use of computing power while reducing the overall cost of resources by using less power, air conditioning, rack space, etc. to maintain the system. With cloud computing,

multiple users can access a single server to retrieve and update their data without purchasing licenses for different applications. In recent times there has been a lot of debate that computing can be provided as a 5th utility after electricity, water, telephone and gas. With the advancements in technology and implementation of IT in every sector irrespective of its characteristics or scale, there is a growing demand for organizations to turn to cloud computing. However there are many challenges which are faced by various types of organizations to bring the benefits of cloud computing to its maximum. Education sector especially higher education sector can yield lot of benefits from the concept of Cloud Computing, however it is imperative to do a consistent research to make it reality in near future. It is very necessary to make Cloud Computing service architecture more appropriate to educational institutions so that Cloud Computing may be adapted by various educational establishments throughout the world.

It is going to be very beneficial for organizations to gain from the features of cloud computing, however it is also very essential to keep the cloud implementations and service models specific to the type of the organization so that a better service can be provided to the organizations of different characteristics. The service model should be designed considering the requirements of a particular type of organization. Similarly in higher education institutions there is a requirement of a service model that can meet the requirements of higher education institutions like colleges and universities. Cloud computing has got a lot of scope in educational institutions, a service model suitable for an educational institution is a key to make cloud computing successful and acceptable in a broader manner by educational establishments. There is certainly

a research gap which needs to be filled i.e. a clear understanding of the features of a typical educational establishment (especially a higher education institute, University or a professional college) and then using this knowledge to device and design a service model that would be more appropriate and beneficial to educational establishments.

This research is intended to provide appropriate service architecture for higher educational establishments so as to yield maximum benefits from cloud implementation in higher educational institutions, this research proposes Learning Resources as a Service ($L_r$aaS). This service architecture specifically keeps the requirements of higher educational establishments in consideration and provides services, applications and software appropriate and useful for higher education establishments. The use of new service architecture would ease the implementation challenges for information technology resources in the institutions. This research is also intended to provide significant challenges which are faced to implement cloud computing in higher education establishments in Oman and India and recommendations and future course of action.

Technology assisted learning is becoming a norm nowadays and most of the educational establishments all over the world are implementing learning management systems, content management systems, virtual networks and virtual machines to support student learning. In modern era of education, educational establishments are even implementing private clouds for enhanced student experience. Although many educational institutions, colleges and universities have successfully deployed and embedded educational technology, many of them are still lacking in many aspects. The aim of this research is to

study the impact of educational technology on educational establishments in Oman, this study also emphasizes on the improvements that are due to enhance educational technology to yield more and more benefits for students in Oman. This research also studies current and future impact of cloud computing on educational technology. Information and Communication Technologies are narrowly integrated for ultimate business solutions in the modern era. Cloud computing is one of such areas which has been frequently debated and thoroughly researched in the resent past and still has lot of scope for research and development. Cloud computing has become a buzz word when future solutions for IT are discussed. This research will study the current features and facilities provided by cloud computing for education in Oman and future possibilities in cloud computing for educational establishments.

6. Proposed Methodology (Approx. 200 words):

Research Methodology provides a systematic approach and steps for a research problem, research methodologies are of different types and are mutually exclusive which means each type of methodology can be adapted exclusively for a single research problem. Research methodologies applied to one research problem may significantly vary with one which is applied to some other research problem. Characteristics of problem in hand generally derive which of methodology should be adapted.

Cloud computing, also known as on-demand computing, is an internet-based computing, where shared resources and information are provided to computers and other devices on-demand. It is a model for enabling ubiquitous, on-demand access to a shared pool of configurable computing resources (Hassan 2014). The services of Cloud computing are

being utilized in the education sector especially in higher education. This research work is a mere effort to provide a slightly better approach to facilitate educational establishments with a more suitable cloud architecture which completely meets their requirements. The methodologies adapted for this research work are varying; this research work uses exploratory methodology as it is an applied research. Moreover qualitative and quantitative methods are followed to understand the exact research gap. The inputs in this case will be collected from various stake holders in higher education across Sultanate of Oman and India. The inputs will be collected from various experienced academicians, teachers in higher education, technicians and lab instructors. Academic administrators can also contribute a lot as far as inputs to this research work are concerned. The sample data will be collected by following the Random/probability sampling design. The optimum sample size is considered to be 10:1 however in this case as the data has be collected from large number of educational institutions across Oman and India it becomes very difficult to meet the sample size requirements especially in India. The sample size of 10:1 will be followed in Oman and educational establishments Rajasthan.

7. Importance of Proposed Research Investigation/ Expected outcome (Approx. 200 words):

Cloud computing in the recent past has created a significant impact on various spheres and fields and education sector is not going to be an exception. Cloud Computing promises to provide computing service similar to any other utility service like electricity, water and internet. Cloud Computing provides various service models which provide different types of cloud services to its tenants based on their requirements. Three well known service models of Cloud Computing are Infrastructure as a service (IaaS), Platform as a Service (PaaS), and Software as a Service (SaaS). Cloud tenants usually choose any or all of these services based on their requirements and are usually available on "pay as you use" bases i.e. you need to pay for the service depending upon the level of use. These basic service architectures of course provide computing services to various organizations however in many of the organizations appropriate services are not delivered as per the requirements of a particular organization. As for example in case of higher education institutions, these service models can provide Infrastructure, platform and software services however the development and deployment of Information Systems relevant to the higher education institution is still to be done by the higher education establishment availing the cloud services. The deployment of e.g. a Learning Management System (LMS) or e.g. the Student Information System (SIS) needs to be done by the educational institution itself. This is one the reasons which creates hindrance for acceptance of cloud computing in many organizations as the service architectures are not comprehensive. This research work proposes service architecture in cloud computing essentially for educational institutions taking into consideration

requirements of higher education institutions in Oman and India. This research work has a lot of significance as it can result in easy embedment of IT and modernization of higher education institutions that may yield enormous benefits in the field of academia. Moreover it will also improve the acceptance of cloud computing especially in higher education institutions which is mere minimal in the present scenario.

8. Review of the work related to the field of Research- already done on the subject -Present and Past Status (Approx.200 words):

There is significant work which has been conducted on educational technology and its implementation in the past. "In 1960, the University of Illinois initiated a classroom system based in linked computer terminals where students could access informational resources on a particular course while listening to the lectures that were recorded via some form of remotely linked device like a television or audio device". "Stanford University psychology professors Patrick Suppes and Richard C. Atkinson experimented with using computers to teach math and reading to young children in elementary schools in East Palo Alto, California". "The Omani Society for Educational Technology (OSET) is a non-profit national organization which was established in 2007 by the ministerial decree 39/2007. The vision of the society is to advance educational technology in Oman by developing strategies that would realize the planning, implementation, and successful application of educational technology through

utilization of technical skills and resources of governmental and private educational organizations, and individuals and experts in the field of educational technology".

Many educational institutions have begun their movement to cloud computing by outsourcing their student email provision (Sclater, 2010). Email is a basic, fairly standardized service, can be provided easily by third parties, and is arguably not core to the educational mission. Both Google and Microsoft offer email services for free to the educational sector in many countries. Cloud computing can also be implemented to create virtual labs for students to practice. The required infrastructure will be provided by the cloud where students can avail the required infrastructure to work on.

The research paper "Cloud computing and emerging IT platforms: Vision, hype, and reality for delivering computing as the 5th utility" reiterates a realistic and achievable idea that computing can be delivered as a 5th service after other basic services. This research paper defines service architecture for cloud computing that can make this possible. The research paper explains various architectures in industry which can be implemented to provide appropriate services to various organizations so that cloud computing can be provided as a service to different organizations irrespective of their scale or characteristics. The vision for computing in 21st century is that computing be provided as a utility service similar to electricity, water, telephone and gas. The perception of computer experts is that computing will be provided as a service like some other services explained above to different types of organizations based on their requirements. These organizations will be charged according to their use. Although this

paper is explaining some key aspects of cloud computing and its future use and some of the features which are currently available however it does not explain how a particular organization will be getting the set of services which are completely feasible and appropriate to them. This research paper also does not explain requirement for any further service models which may be more beneficial and appropriate for a particular organization. This research paper does not explain any drawbacks or lacking of the implementation or the implications if computing will be provided as a service by implementing cloud computing. Cloud computing may be answer to many things and its implementation may promise a lot however one needs to be aware that real benefits of cloud computing cannot be attained by the organizations unless cloud computing service models are resigned appropriate to various types of organizations in accordance with their business needs and requirements. We cannot expect organizations in today's environment to avail the services of cloud computing at high prices and then implement their core functional applications, customized software, web-sites, information systems and database's of their own. In this manner an organization is actually paying for the cloud functions which are incomplete as overhead of development which in fact is huge will remain with the organizations.

The need of the time is to design a more meticulous service architecture specific to each type of the organization that can meet the requirements of that organization in a better manner, not only providing them with infrastructure, operating system and software however providing them an environment in which they can deploy information systems of their need. This service architecture will result in greater implementation and

acceptance of cloud computing in various organizations irrespective of their scale and characteristics.

9. Research Gaps identified in the proposed field of investigation - Based on review (Approx. 100 words):

With advancements in Information Technology, technology assisted learning and educational technology may see one more paradigm shift in next few years by implementation of enhanced technologies in teaching and learning like Cloud Computing. Although Cloud Computing has been implemented in many fields successfully include education sector however to yield maximum benefits from cloud computing in higher education, need is to much closely understand the requirements of higher education institutions. The need of the hour is a research study which can highlight the current expectations of stake holders of Higher Education establishments' viz-a-viz cloud computing especially in context to a specific region. The need of the hour is also to provide a more realistic and appropriate service model of Cloud for higher education establishments. Current cloud service models such as Infrastructure as a Server (IaaS), Platform as a Service (PaaS) and Software as a Service (SaaS) may not fittingly fulfill the requirements of most of the educational establishments, which is biggest hindrance for educational establishments to move towards Cloud Computing.

After a detailed literature review and exhaustive reading of more than sixty research papers, journals and web resources, the following gaps were found in the area.

1. A clear picture of expectations of stake holders of higher education establishments like educationalists, teachers, students, Lab technicians, Systems Administrators /Developers and management from cloud computing is not available and requires exhaustive data collection and analysis.
2. The current literature does not provide any clear emphasis on appropriateness of cloud services with respect to educational establishments on the foundation of some research study or survey and cannot provide enough knowledge for improving these services especially in context to educational establishments in Oman and India.
3. The current service architectures of Cloud Computing are having various limitations with respect to their implementation and embedment in educational establishments and need refinement so that unique and exclusive service architecture can be envisioned and realized for educational establishments.

The above research gaps are intended to be addressed fully or with certain limitations in this research study.

10. Chapter wise details of Proposed Research Investigation Ph.D. Thesis:

1. Introduction

   This section will provide an in-depth introduction to the research problem explaining its in's and out's as well as providing a meticulous background of the study and clear evidences that the topic has been researched in the past and providing a brief idea about the level of research done and therein highlighting the gaps in the research

2. Literature Review

   A literature survey typically explains and puts in proper perspective what has gone before in the field of your research topic. With literature survey a researcher is able to establish a link between his research topic and the previous research done in the area, critically analyze the background of the research.

3. Proposed solution/ methodology

   Choosing an appropriate methodology for the research is a challenging task. This section explains the type of methodology or methodologies adapted for the research study and underlying reasons for choosing a specific type of research methodology. This section will describe the literature that was reviewed to identify a research gap. This will include the meticulous details about various publications, conference proceedings, previous research, PHD thesis, a project report, survey previously conducted in the related field.

Literature review consists of the details taken from various sources to reach to a specific conclusion imposing a research gap.

4. Solution Validation, Analysis of the Data, Results, and Discussion

This phase includes the collection of data from various sources. This phase is a process of collection information from various sources in a systematic manner enabling a researcher to answer various questions and evaluate outcomes. The goal of data collection is to acquire quality evidence which can be transformed to a rich data analysis that will result in building a credible answer to the problems posed in the research. Analysis is a process of digging, inspecting, drilling, cleaning, transforming and modeling data with a prime motive of discovering information, Decision making and reaching conclusions. There are various approaches of data analysis, depending upon the field of research study encompassing diverse techniques with different names. Data is like building blocks which can lead to the formation of information if it is arranged in a systematic and logical manner. This information when applied or used becomes knowledge. Interpreting the data is a process of joining the dots or linking and interpreting data collected in a useful manner. This section will also be including the critical review of the results achieved and the appropriateness of the results reflecting the achievements critically. This can also include the limitations of the results achieved.

5. Conclusions / Recommendations

   This section provides details of the conclusions of the research study. This chapter provides brief description of the results and their potency and extensibility to the future research or work. The conclusions section also provides the idea and scope of future research that can be done and which may lead to more benefits and fact finding.

6. Bibliography/References

   A very significant and important component of any research work is the association and reference to the previous research work conducted in the similar field. This section meticulously lists the references and duly acknowledges the use of any past research work that has been used in the current research. References may also include the work done by the author of the current work previously that has been published in the past. This section is provided in the one of the standard international styles.

7. Appendices

   The conducted research may contain a large quantity of data in detail that will be too lengthy for inclusion in the main body, e.g. data collection through questionnaires, interviews, surveys etc. Appendices may include all the above types of data; it may also contain a research data which may be indirectly related to the research.

11. Expected duration of the investigation (Year wise schedule to be give):

A detailed schedule showing the tasks year wise is separately provided in a file. The schedule provides minute details about the tasks throughout the three years study; however this schedule is subjected to the change anytime due various reasons. A margin of +- 75 working days is kept which is approximately 7.9 % of the total duration which quite fair and realistic considering huge duration of 3 years and complexity of tasks, moreover various external and internal time risks need to be kept in consideration. Days mentioned in the schedule are working days excluding Sundays. Moderation to the schedule can be made by research guide anytime that will be intimated to University appropriately.

12. Facilities available for the investigation at scholar end and facilities required on campus:

Research analysis will be conducted on prime higher education Institutions and Universities in Oman. Data will be collected from few Universities in India as well however most of analysis part will be done in Oman and approvals and permissions therein will be acquired by the researcher. Moreover a test bed of cloud characterizing new service architecture will also be taken care from the researcher in his parent organization. University side few resources are required mandatorily. Access to reputed journals and conference proceedings will be required especially those related to the field of cloud computing. Books on cloud computing would be required from the

university side, so that reading can be done by the scholar during his stay in the university. Scholar may need the facility of printing during the stay in University which should be granted from time to time. Library and computer lab resources may be availed by the research scholar from time to time during his stay in the University which should be granted as required.

13. Bibliography

[1]. Rajkumar Buyyaa,b,, Chee Shin Yeoa, Srikumar Venugopala, James Broberg a, Ivona Brandic c. Cloud computing and emerging IT platforms Vision, hype, and reality for delivering computing as the 5th utility, Elsevier.

[2]. Nabil Sultan, Cloud computing for education: A new dawn, Elsevier.

[3]. Tuncay Ercan, Effective use of cloud computing in educational institutions.

[4]. Tashkandi, A.; Al-Jabri, I. "Cloud Computing Adoption by Higher Education Institutions in Saudi Arabia: Analysis Based on TOE", *Cloud Computing (ICCC), 2015 International Conference on,* On page(s): 1 – 8.

[5]. Osman, A.; Abdalrahman, S.M.; Elgelany, A. "Proposed Academic Cloud Computing for Saudi Universities and Higher Institutes", *e-Learning "Best Practices in Management, Design and Development of e-Courses: Standards of Excellence and Creativity" , 2013 Fourth International Conference on,* On page(s): 113 - 119

[6]. Qing Ding; Xi Li; Ye Liu; Zhu Shi "Research on Remote Collaborative Engineering Practices for Master of Software Engineering Based on Cloud Computing Environment", *Software Engineering Education and Training (CSEE&T), 2012 IEEE 25th Conference on,* On page(s): 110 - 114

[7]. Gupta, A.K. "Journey from traditional to recent emerging techniques in education system: An overview", *MOOCs, Innovation and Technology in Education (MITE), 2015 IEEE 3rd International Conference on,* On page(s): 219 - 223

[8]. Yucong Duan; Yuan Cao; Xiaobing Sun "Various “aaS” of everything as a service", *Software Engineering, Artificial Intelligence, Networking and Parallel/Distributed Computing (SNPD), 2015 16th IEEE/ACIS International Conference on,* On page(s): 1 - 6

[9]. David, G.S.S.; Anbuselvi, R. "An architecture for Cloud computing in Higher Education", *Soft-Computing and Networks Security (ICSNS), 2015 International Conference on,* On page(s): 1 - 6

[10]. Fragoudakis, C.; Karampatsis, M.; Potikas, P. "Towards a "Cloud Enabled" University Computer Center", *P2P, Parallel, Grid, Cloud and Internet Computing (3PGCIC), 2013 Eighth International Conference on,* On page(s): 193 - 199

[11]. Selvi, S.T.; Perumal, P. "Blended learning for programming in cloud based e-Learning system", *Recent Trends In Information Technology (ICRTIT), 2012 International Conference on,* On page(s): 197 - 201

[12]. Yucong Duan; Guohua Fu; Nianjun Zhou; Xiaobing Sun; Narendra, N.C.; Bo Hu "Everything as a Service (XaaS) on the Cloud: Origins, Current and Future Trends", *Cloud Computing (CLOUD), 2015 IEEE 8th International Conference on,* On page(s): 621 - 628

[13]. Yu Liu; Bo Li; Jianwei Niu; Qinghua Cao "A Cloud-Based Experiment Platform for Computer-Based Education", *Utility and Cloud Computing (UCC), 2014 IEEE/ACM 7th International Conference on,*On page(s): 626 - 629

[14]. Ngoc Hong Tran; Tran, H.D.; Chiem, P.T.; Luu, D.T.; Tan Dang Cao; Kaskenpalo, P. "CenLavi: Virtual Computer Network Laboratory", *Ubiquitous and Future Networks (ICUFN), 2013 Fifth International Conference on,* On page(s): 523 - 528

[15]. R. Bristow, T. Dodds, R. Northam and L. Plugge, "Cloud computing and the power to choose",*EDUCAUSE Review*, vol. 45, no. 3, pp. 14-30, 2011 Available: print

[16]. J. Cappos, I. Beschastnikh, A. Krishnamurthy, T. Anderson, Sue Fitzgerald, Mark Guzdial, Gary Lewandowski and Steven A. Wolfman, "Seattle: a platform for educational cloud computing", *In the Proceedings of the 40th ACM Technical Symposium on Computer Science Education (SIGCSE 2009)*, pp. 111-115, 2009.

[17]. V. Chang, D. Bacigalupo, G. Wills and D. De Roure, "A categorisation of cloud computing business models", *In the Proceedings of the 10th IEEE/ACM International Conference on Cluster, Cloud and, Grid Computing (CCGrid 2010), M. Parashar and R. Buyya, Eds.*, pp. 509-512, 2010

[18]. EDUCAUSE, "7 Things you should know about cloud computing", *EDUCAUSE*, 2011, [online] Available: online

[19]. T. Ercana, "Effective use of cloud computing in educational institutions", *Procedia Social and Behavioral Sciences*, vol. 2, pp. 938-942, 2010

[20]. F. Etro, "The economic consequences of the diffusion of cloud computing", *In the Global Information Technology Report 2009?2010: ICT for Sustainability, S. Dutta and I. Mia, Eds*, pp. 107-112, 2011, [online] Available: online

[21]. H. Gao, Y.-j. Zhai and Yanwen Wu, "System design of cloud computing based on Mobile Learning",*In the Proceedings of the 2010 3rd International Symposium on Knowledge Acquisition and Modeling (KAM 2010)*, pp. 239-242, 2010

[22]. B. Hayes, "Cloud computing", *Communications of the ACM*, vol. 51, no. 7, pp. 9-11, 2008

Additional References

[1]. D. R. Herrick, G. Farally-Semerad, K. J. McRitchie and E. Rugg, "Google this! using Google Apps for collaboration and productivity", *In the Proceedings of the ACM SIGUCCS Fall Conference on User Services (SIGUCCS 2009)*, pp. 11-14

[2]. Jericho Forum, "Cloud cube model: selecting cloud formations for secure collaboration", *Version 1.0*, 2011, [online] Available: online

[3]. L. Johnson, A. Levine and R. Smith, "The Horizon report: 2009 edition", *Austin, Texas, USA: The New Media Consortium (NMC), 2009. [Online]. Retrieved*, 2011.

[4]. L. Johnson, A. Levine, R. Smith and S. Stone, "The Horizon report: 2010 edition", *2010, Austin, Texas, USA:The New Media Consortium (NMC), 2010 [Online]. Retrieved*, 2011.

[5]. L. Johnson, R. Smith, H. Willis, A.Levine and K. Haywood, "The Horizon report: 2011 edition",*2011, Austin, Texas, USA:The New Media Consortium (NMC), 2011 [Online]. Retrieved*, 2011

[6]. Y. Khmelevsky and V. Voytenko, "Cloud computing infrastructure prototype for university education and research", *In the Proceedings of the 15th Western Canadian Conference on Computing Education (WCCCE 2010).*

[7]. G. Lin, D. Fu, J. Zhu and G. Dasmalchi, "Cloud computing: IT as a Service", *IT Professional*, vol. 11, no. 2, pp. 10-13, 2009

[8]. P. Mell and T. Grance, "The NIST definition of cloud computing (Draft): Recommendations of the National Institute of Standards and Technology", *Computer Security Division, Information Technology Laboratory (ITL), National Institute of Standards and Technology (NIST), U.S. Department of Commerce, Gaithersburg, MD, USA. [Online]. Retrieved*, 2011.

[9]. L. Mei, W. K. Chan and T. H. Tse, "A tale of clouds: paradigm comparisons and some thoughts on research issues", *In the Proceedings of the 3rd IEEE Asia-Pacific Services Computing Conference (IEEE APSCC 2008)*, pp. 464-469, 2008

[10]. S. F. A. Razak, "Cloud computing in Malaysia universities", *In the Proceedings of the 2009 Conference on Innovative Technologies in Intelligent Systems and Industrial Applications (CITISIA 2009)*, pp. 101-106, 2009

[11]. T. L. Ruthkoski, "Exploratory project: State of the cloud, from University of Michigan and beyond",*In the Proceedings of the 2nd IEEE International Conference on Cloud Computing Technology and Science (CloudCom 2010), Indianapolis, Indiana, USA, 30 November - 3 December, 2010, J. Qiu, G. Zhao, and C. Rong, Eds.*, pp. 427-432, 2010

[12]. Y. Zhang, L. Guan and L. Yuting, "Cloud computing assisted instructions in China", *In the Proceedings of the 2010 International Conference on Educational and Information Technology (ICEIT 2010), September 17?19, 2010, Chongqing, China*, vol. 440, pp. 2-438, 2010

[13]. M. Zhou, R. Zhang, D. Zeng and W. Qian, "Services in the cloud computing era: A survey", *In the Proceedings of the 2010 4th International Universal Communication Symposium (IUCS2010), October 18?19, 2010, Beijing, China*, pp. 40-46, 2010

[22]. Fasihuddin, H.; Skinner, G.; Athauda, R. "A holistic review of cloud-based e-learning system", *Teaching, Assessment and Learning for Engineering (TALE), 2012 IEEE International Conference on,* On page(s): H1C-6 - H1C-11

[23]. Chawla, D. and Sondhi, N. (2011) Research Mehtodology Concepts and Cases. Vikas Publishing House Pvt. Ltd.

[24]. Creswell, J.W. (2008) Educational Research: Planning, conducting, and evaluating quantitative and qualitative research (3rd ed.). Upper Saddle River : Pearson.

[25]. Creswell, J.W. (2008) Educational Research: Planning, Conducting, and Evaluating Quantitative and Qualitative Research. Pearson Education, Inc.

[26]. Curiosity Creates Cures: The Value and Impact of Basic Research', National Institute of General Medical Science.

[27]. Davis, B. (2000) 'Limited scope of science & Technology', The scientist's world.

[28]. Gauch, J..H.G. (2003) Scientific method in practice. Cambridge, UK : Cambridge University Press.

[29]. Hassan, Q. (2014) 'Demystifying Cloud Computing', The Journal of Defense Software Engineering (CrossTalk) , December, pp. 16-21.

[30]. Kara (2012) 'Research and Evaluation for Busy Practitioners', The Policy Press, p. 102.

[31]. Karagianis, L. (2015) 'How discovery science is reinventing the world - MIT News', MIT News., April.

[32]. Kothari, C.R. (2004) Research Methodology Methods and Techniques. 2nd edition Delhi : New Age International (P) Limited, Publishers.

[33]. Kumar, R. (2005) Research Mehtodology: A step by step Guide for beginners. 2nd edition SAGE Publications.

[34]. Liu, A. (2015) ' Structural Equation Modeling and Latent Variable Approaches', John Wiley & Sons.

[35]. Matusov, E. and Brobst, J. (2013) 'Radical experiment in dialogic pedagogy in higher education and its centaur failure: Chronotopic analysis. Hauppauge', Nova Science Publishers.

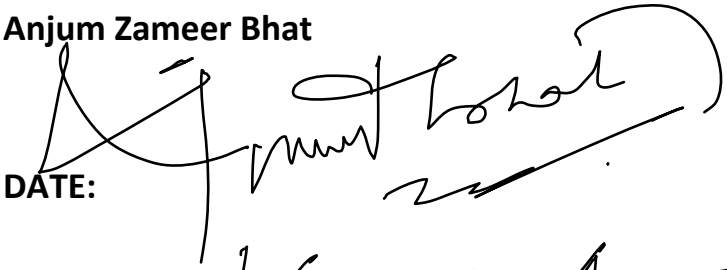
[36]. Proposed standard practice for surveys on research and experimental development (2012), 27 May, [Online], Available: www.oecd.org/sti/frascatimanual.

[37]. Rajasekar, S., Philominathan, P. and Chinnathambi, V. (2013) 'RESEARCH METHODOLOGY'. Rajasekar, S., Philominathan, P. and Chinnathambi, V. (2013) 'RESEARCH METHODOLOGY', October.

[38]. Rocco, T.S., Hatcher, T. and Creswell, J.W. (2011) The handbook of scholarly writing and publishing. San Francisco, CA : John Wiley & SonsShuttleworth, M. (2011) Definition of Research, 14 August.

NAME AND SIGNATURE OF SCHOLAR

Anjum Zameer Bhat



DATE: 16-04-2016